STABILITY OF PLASMA POLYMERS DEPOSITED USING ARGON/AIR/ACETYLENE PLASMA JET

Alonso H. Ricci Castro[1]*, Vadym Prysiazhnyi[1], Rogerio P. Mota[1], Konstantin G. Kostov[1], Antje Quade[2]
[1]*Faculty of engineering of Guaratinguetá, São Paulo State University (FEG-UNESP), Guaratinguetá, Brazil.*
[2]*Leibniz Institute for Plasma Science and Technology (INP Greifswald), Greifswald, Germany.*

1. Introduction

The atmospheric pressure plasma was investigated by several research groups with a principal goal of obtaining continuous plasma deposition process [1]. The plasma polymerized acetylene coatings have several advantageous properties, they exhibit inert behavior to acidic and basic solutions and can be used as barrier coatings or interface layers for immobilization of proteins [2,3]. In this work, chemical properties and water stability of acetylene films deposited with atmospheric plasma jet were studied. XPS and FTIR were used to study the chemical composition and molecular groups on the surface, the film thickness was analyzed using confocal profilometry. Water stability of the deposited coatings was evaluated for four different substrate pretreatments.

2. Experimental

The atmospheric pressure plasma jet consists of a high voltage (HV) electrode (tungsten rod of 2 mm diameter) inserted inside a dielectric enclosure composed of three parts. The first one is a teflon piece for fixing the HV electrode and admitting the primary working gas (argon). The middle part is a Pyrex glass tube (length 7 cm and 8 mm internal diameter). The third part is a teflon nozzle that has an inlet for admitting secondary gas (mixture of acetylene and air) and also a grounded electrode in a form of aluminum adhesive tape that where was wrapped on the lower part of the piece. The parameters of atmospheric plasma jet were: applied voltage 17 kVp-p, signal frequency 19 kHz, argon flow 0.45 L/min and acetylene/air flow 0.045 L/min.

3. Results and Discussions

After extensive research a certain window of deposition parameters was found a stable film was formed on the glass substrate (Figure 1). The chemical composition of polymer films deposited from Ar/air/acetylene mixture exhibited carbon-carbon, carbon-oxygen and hydroxyl bonds (Figure 2). Certain post-deposition chemical transformations were observed and will be presented. It was also shown that different glass pretreatments led to different water solubility of the deposited film.

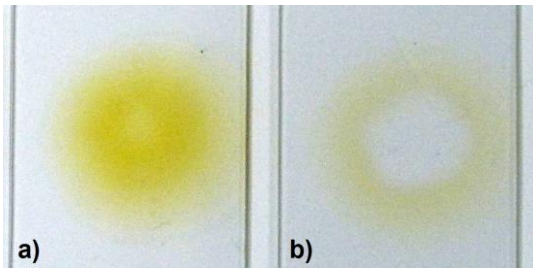

Fig. 1. Acetylene film as deposited (a) and acetylene film washed (b).

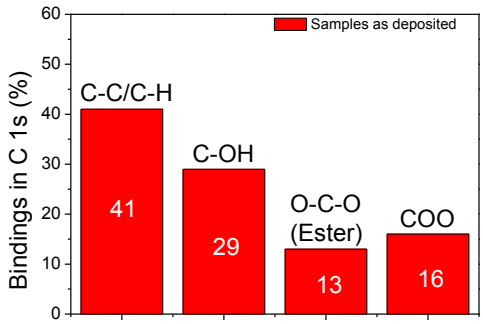

Fig. 2. Functional groups present on acetylene films.

4. References

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*Corresponding author: Alonso_elfisico@yahoo.com